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REMARKS

Claims 1-7, 9-18, 20-24, 26-45, 47-60, 62-69 and 71-85 are pending. Claims 1, 18, 23, 33, 45, 51, 60, 69, 74 are amended. No new matter is added. Claims 1-7, 9-18, 20-24, 26-45, 47-60, 62-69 and 71-85 are rejected under 35 U.S.C. 103(a) as being unpatentable over US Patent No. 6,246,896 ("Dumoulin"), in view of WO 98/52461 ("Minkoff"), US Patent No. 6,701,176 ("Halperin") and further in view of US Patent No. 5,964,705 ("Truwit").

Information Disclosure Statement

Applicant submitted an Information Disclosure Statement on May 25, 2005. Applicant respectfully requests that the Examiner consider the references cited therein and return an initialed Form PTO-1449.

Claims 1-7, 9-18, 20-24, 26-32

Claim 1, as amended, recites a method of recanalizing a substantially totally occluded vessel in a subject, including the steps of obtaining an image, guiding a recanalization device using the obtained image and recanalizing the occluded vessel. The image is obtained from within the vessel of the substantially totally occluded vessel using magnetic resonance. A magnetic resonance signal is received with an external receiver located external to the body of the subject. A map image is generated of the occluded vessel using the signal received by the external receiver. A magnetic resonance signal is received with a first and a second internal antennae positioned within the occluded vessel and near an occlusion. At least one of the first or the second internal antennae is an open wire length antenna. The map image of the occluded vessel is locally enhanced using the signal received by the internal antennae. A recanalization device is guided using the obtained image, where the internal antennae are coupled to the recanalization device. The occluded vessel is recanalized with the recanalization device.

The Examiner asserts that Dumoulin in combination with Minkoff teach the limitations of claim 1. Halperin is relied on for teaching that an RF antenna can be used for internal imaging and ablation. Truwit is relied on for showing two antennae.

Dumoulin discloses an MRI guided ablation system. An MRI image obtained using signals from an external receiver is used by a physician performing an ablation procedure. The

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MRI system also acquires tracking signals from a tracking coil in the ablation device, calculates the position of the tracking coil and overlays an icon of the ablation device on the image being displayed. The physician uses the display to guide the ablation device into the desired position in the patient [see Col. 7, lines 1-9]. No image of the patient is produced from the tracking coil signals. Minkoff describes generating an MRI image of a heart with an improved signal to noise ratio (SNR) by using signals received from two antennae, one external to the patient's body and one internal to the body.

Claim 1 recites a method whereby a physician recanalizing an occluded vessel is provided with an image of the occluded vessel that is generated using signals from both an external receiver and internal antennae, where the internal antennae are within the occluded vessel at or near the occlusion, and the internal antennae are coupled to the recanalization device. Enhancing the image of the occluded vessel by using signals from the internal antennae positioned right within the occluded vessel provides the physician with a better image from which to work, as compared, for example, to a conventional MRI image as used in Dumoulin.

Minkoff describes generating an MRI image of a heart using both external and internal antennas, but in a context quite different than what is claimed. For example, in Minkoff, when imaging a patient's heart, the internal antenna can be inserted into the patient's body through the esophagus, so that the internal antenna can get close to the heart: the internal antenna is not within the heart itself. Further, Minkoff does not describe generating this image under conditions where a physician is then, in real-time, using the generated image to perform a procedure.

Therefore, neither Dumoulin nor Minkoff, alone or in combination, disclose guiding a recanalization device using an image obtained from both internal and external receivers/antennae. Dumoulin only uses an external receiver to obtain an image. Minkoff obtains an image using external and internal antennae, however, does not disclose an internal antenna coupled to a recanalization device, nor coupled to a device within a vessel upon with work is being performed (e.g., recanalizing an occluded vessel).

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Claim 1 further requires the use of at least two internal antennae, where at least one of the internal antennae is an open wire length antenna. None of the references disclose an apparatus including this feature. Truwit, which is relied on for showing an apparatus with two antennae, describes an apparatus with a pair of microcoils for MRI imaging. The preferred construction uses an opposed solenoid orientation of microcoils (Col. 4, lines 45-46). The microcoils disclosed in Truwit are not open wire length antennae. By contrast, to combine the teachings of Truwit with what is taught in Dumoulin, Minkoff and Halperin would result in an apparatus including microcoil type antennae; therefore, teaching away from what is recited in claim 1, as claim 1 requires at least one open wire length antenna. Halperin discloses a loopless type antenna, but there is no motivation to combine the teachings of Truwit with Halperin, as Truwit is directed at an improved microcoil type antenna.

Accordingly, claim 1 is allowable over Dumoulin in view of Minkoff and further in view of Halperin and Truwit. Claims 2-7, 9-18, 20-24 and 26-32 depend from claim 1 and are therefore allowable for at least the same reasons.

Claims 33-45 and 47-59

Claim 33 recites a method of recanalizing a substantially totally occluded vessel in a subject. The method includes the steps: (a) obtaining an image from within the vessel of the substantially totally occluded vessel using magnetic resonance; (b) guiding a recanalization device using the obtained image, the internal antenna being coupled to the recanalization device; and (c) recanalizing the occluded vessel with the recanalization device. The step of obtaining an image from within the vessel includes the sub-steps of: (i) receiving a magnetic resonance signal with an external receiver located external to the body of the subject; (ii) generating a map image of the occluded vessel using the signal received by the external receiver; (iii) receiving a magnetic resonance signal with a first internal antenna and a second internal antenna positioned within the occluded vessel and near an occlusion; and (iv) generating a local image of the occluded vessel using the signals received by the first and second internal antennae. At least one of the first or the second internal antennae is an open wire length antenna.

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As discussed above in reference to claim 1, neither Dumoulin nor Minkoff disclose guiding a recanalization device using an image obtained from both internal and external receivers/antennae. Dumoulin only uses an external receiver to obtain an image. Minkoff obtains an image using external and internal antennae, however, does not disclose an internal antenna coupled to a recanalization device, nor coupled to a device within a vessel upon with work is being performed (e.g., recanalizing an occluded vessel).

Claim 33 further requires the use of at least two internal antennae, where at least one of the internal antennae is an open wire length antenna. None of the references disclose an apparatus including this feature. Truwit, which is relied on for showing an apparatus with two antennae, describes an apparatus with a pair of microcoils for MRI imaging. The preferred construction uses an opposed solenoid orientation of microcoils (Col. 4, lines 45-46). The microcoils disclosed in Truwit are not open wire length antennae. By contrast, to combine the teachings of Truwit with what is taught in Dumoulin, Minkoff and Halperin would result in an apparatus including microcoil type antennae; therefore, teaching away from what is recited in claim 33, as claim 33 requires at least one open wire length antenna. Halperin discloses a loopless type antenna, but there is no motivation to combine the teachings of Truwit with Halperin, as Truwit is directed at an improved microcoil type antenna. Accordingly, claim 33 is allowable over Dumoulin in view of Minkoff further in view of Halperin and Truwit. Claims 34-45 and 47-59 depend from claim 33 and are therefore allowable for at least the same reasons.

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Claims 60, 62-69 and 71-85

Claim 60 recites an apparatus for imaging an occluded vessel in a subject. The apparatus includes a magnetic field generator adapted to establish a magnetic field on the subject, a magnetic field gradient generator adapted to establish gradients in the magnetic field and a radio frequency (RF) signal generator adapted to emit pulsed RF signals to at least the occluded vessel of the subject. The apparatus further includes an external RF receiver and first and second internal antennae. The external RF receiver is adapted to be positioned external to the body of the subject, to receive RF signals emitted from the subject in response to the RF pulses and to provide an output signal in response to the received signals. The first and second internal RF antennae are each adapted to be positioned in the occluded vessel proximate the occlusion, to receive RF signals emitted from the subject in response to the RF pulses and to provide an output signal in response to the received signals. At least one of the first or the second internal RF antennae is an open wire length antenna. The apparatus further includes a controller adapted to receive and process the output signals from the external and internal RF antennas and to produce magnetic resonance (MR) information related thereto, and visual display adapted to receive the MR information produced by the processor and to display the MR information as an image of the occluded vessel. At least one of the first internal RF antenna or the second internal RF antenna is associated with a recanalization device adapted to be positioned in the vessel proximate the occlusion and to recanalize the occluded vessel.

For at least the reasons stated above in reference to claim 1, As discussed above in reference to claim 1, neither Dumoulin nor Minkoff disclose recanalization device adapted to be positioned in a vessel proximate an occlusion, where the recanalization device is associated with at least one of a first and a second internal RF antennae, and using an image obtained from both internal antennae and an external receiver. Dumoulin only uses an external receiver to obtain an image. Minkoff obtains an image using external and internal antennae, however, does not disclose an internal antenna associated with a recanalization device, nor associated with a device within a vessel upon which work is being performed (e.g., recanalizing an occluded vessel).

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Claim 60 further requires the use of at least two internal antennae, where at least one of the internal antennae is an open wire length antenna. None of the references disclose an apparatus including this feature. Truwit, which is relied on for showing an apparatus with two antennae, describes an apparatus with a pair of microcoils for MRI imaging. The preferred construction uses an opposed solenoid orientation of microcoils (Col. 4, lines 45-46). The microcoils disclosed in Truwit are not open wire length antennae. By contrast, to combine the teachings of Truwit with what is taught in Dumoulin, Minkoff and Halperin would result in an apparatus including microcoil type antennae; therefore, teaching away from the apparatus recited in claim 60, as claim 60 requires at least one open wire length antenna. Halperin discloses a loopless type antenna, but there is no motivation to combine the teachings of Truwit with Halperin, as Truwit is directed at an improved microcoil type antenna.

Accordingly, claim 60 is allowable over Dumoulin in view of Minkoff further in view of Halperin. Claims 62-69 and 71-85 depend from claim 60 and are therefore allowable for at least the same reasons.

No fees are believed due, however, please apply any other charges or credits to deposit account 06-1050.

Respectfully submitted,

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